

AN UNUSUAL LEAF-LIKE GORGONIAN
(COELENTERATA: OCTOCORALLIA)
FROM THE GREAT BARRIER REEF, AUSTRALIA

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ABSTRACT

A leaf-like gorgonian, *Hicksonella expansa* sp. nov. from the family Gorgoniidae is described and illustrated, and a comparison made with *H. princeps* Nutting, 1910, the only other known species of the genus. *H. expansa* has a very variable colony morphology and is the first leaf-like gorgonian known from the Indo-Pacific Region.

KEYWORDS: Gorgonian, *Hicksonella*, Coelenterata, Octocorallia, Australia.

INTRODUCTION

There are only a few species of holaxonia with more-or-less expanded coenenchyme, and they have been found only within the family Gorgoniidae. *Phycogorgia* Milne Edwards and Haime, 1850, *Phyllogorgia* Milne Edwards and Haime, 1850, and to a lesser extent *Pseudopterogorgia* Kukenthal, 1919, show this feature (Bayer 1956, 1961). These genera are reported from Chile, Brazil and the West Indies-Florida area respectively. There are very few Gorgoniidae known from waters other than those of the Americas and the West Indies. Those that are known are Indo-Pacific taxa. Species of *Rumphella* Bayer, 1955, and *Hicksonella* Nutting, 1910, previously classified with the Plexauridae but assigned to the Gorgoniidae by Bayer (1981), and some species of *Pseudopterogorgia* make up the group. *Hicksonella expansa* sp. nov., described below, adds another species to this short list and is the first leaf-like gorgonian known from this area.

The species was first discovered by Dr Zena Dinesen whilst on the staff of the Australian Institute of Marine Sciences, Townsville. Requests to Dr Dinesen and another colleague, Dr John Coll, Chemistry Department, James Cook University, Townsville, to look out for more material resulted in 6 more specimens being located. A seventh, amongst a collection of unidentified sponges in the Queensland Museum, was brought to my attention by Mr John Hooper of the Northern Territory Museum.

Abbreviations: NTM Northern Territory Museum of Arts and Sciences, Darwin; QM Queensland Museum, Brisbane.

SYSTEMATICS

Hicksonella expansa sp. nov.
(Figs 1-11)

Type material. All material was collected from the Great Barrier Reef, Australia. HOLOTYPE - NTM C4170, Flinders Reef (South), 17°37'S 148°31'E, 21 November 1981, 30 m depth, Z. Dinesen. PARATYPES - USNM 76294, NTM C4174, same data as for holotype; NTM C4168, Lizard Island, 14°40'S, 145°28'E, 18 August 1981, 7 m depth, J. Coll; NTM C4171, NTM C4172, Davies Reef, 18°55'S, 147°39'E, 3 March 1982, 12 m depth, Z. Dinesen; NTM C4173, John Brewer Reef, 18°37'S, 147°04'E, 8 February 1981, 10 m depth, Z. Dinesen; QM GL2742, Stanley Reef, 19°17'S, 148°08'E, 15 October 1981, 10-15 m depth, A. Kay.

Diagnosis. Colonies flabellate. Axis with a narrow core and no loculation. Coenenchyme discontinuously expanded over irregular pinnate ramifications producing lacinated leaf-like specimens. Sclerites of the surface layer, occasionally heavily warted and occasionally poorly differentiated, are predominantly wart clubs with a central wart and a whorl of 3 large warts in the club head. Sclerites of the subsurface layer are mostly warty spindles, sometimes with a waist, sometimes densely sculptured, sometimes with thorny warts. Amongst these sclerites

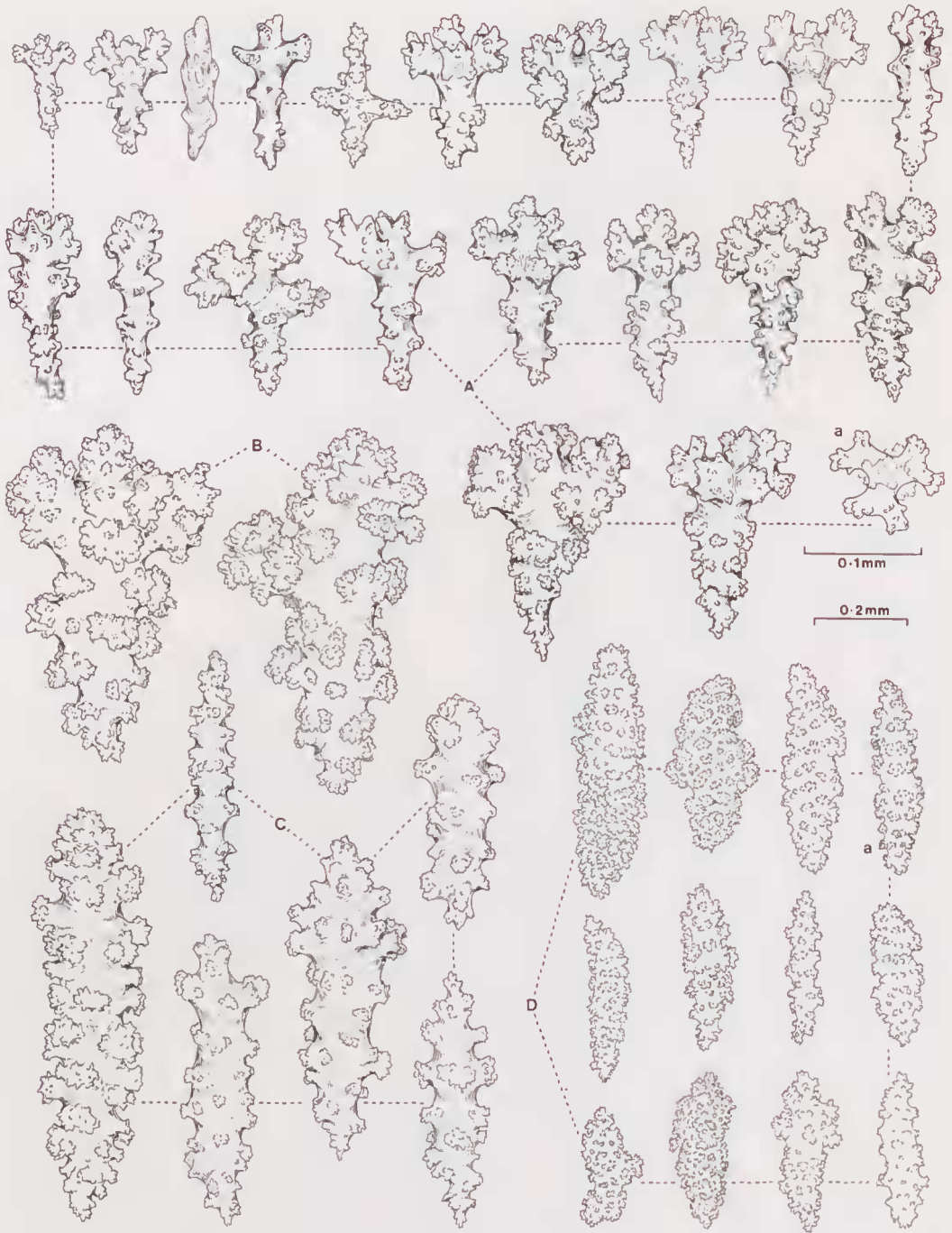


Fig. 1. *Hicksonella expansa* holotype: A, sclerites from the surface layer; B-D, sclerites from the subsurface layer. A-C, 0.1 mm scale; D, 0.2 mm scale.

are scattered large smooth-shafted rods with warty handles, characteristic of the genus. Coenenchyme next to the axis with small rods and spindles often with warts in whorls. Polyps armed with flattened, sometimes

scale-like, rodlets, and totally retractile into the general coenenchyme.

Description. The flabellate holotype (Fig. 7A) is ramified in one plane producing a lacinated leaf-like appearance. The purely

horny axis is circular in section with a narrow cross chambered core and no loculation. The mode of axial branching is irregularly pinnate with occasional anastomoses. Branching occurs to the 6th order. The nature of the branching is partly masked by the expanded coenenchyme which grows web-like between the branches. The web is not continuous and is perforated by a number of irregularly shaped holes. Figure 11 shows the holotype and several paratypes photographed using back-lighting to silhouette the axial ramifications. The general aspect of the colony resembles that of the Brazilian gorgoniid

Phyllogorgia dilatata (Esper) (see Bayer 1961).

The colony is 27.5 cms high and 26 cms across, and has a small holdfast 24 mm across. The coenenchyme is variable in thickness. It covers the larger branches to a depth of about 0.7 mm. In the thinnest web areas the total thickness is still of this order. In terminal twigs, however, where the axis may only be 0.15 mm in diameter the total branch width may be 3 mm.

The polyps are completely retracted, very small, and irregularly distributed over both faces of the colony. For the most part the

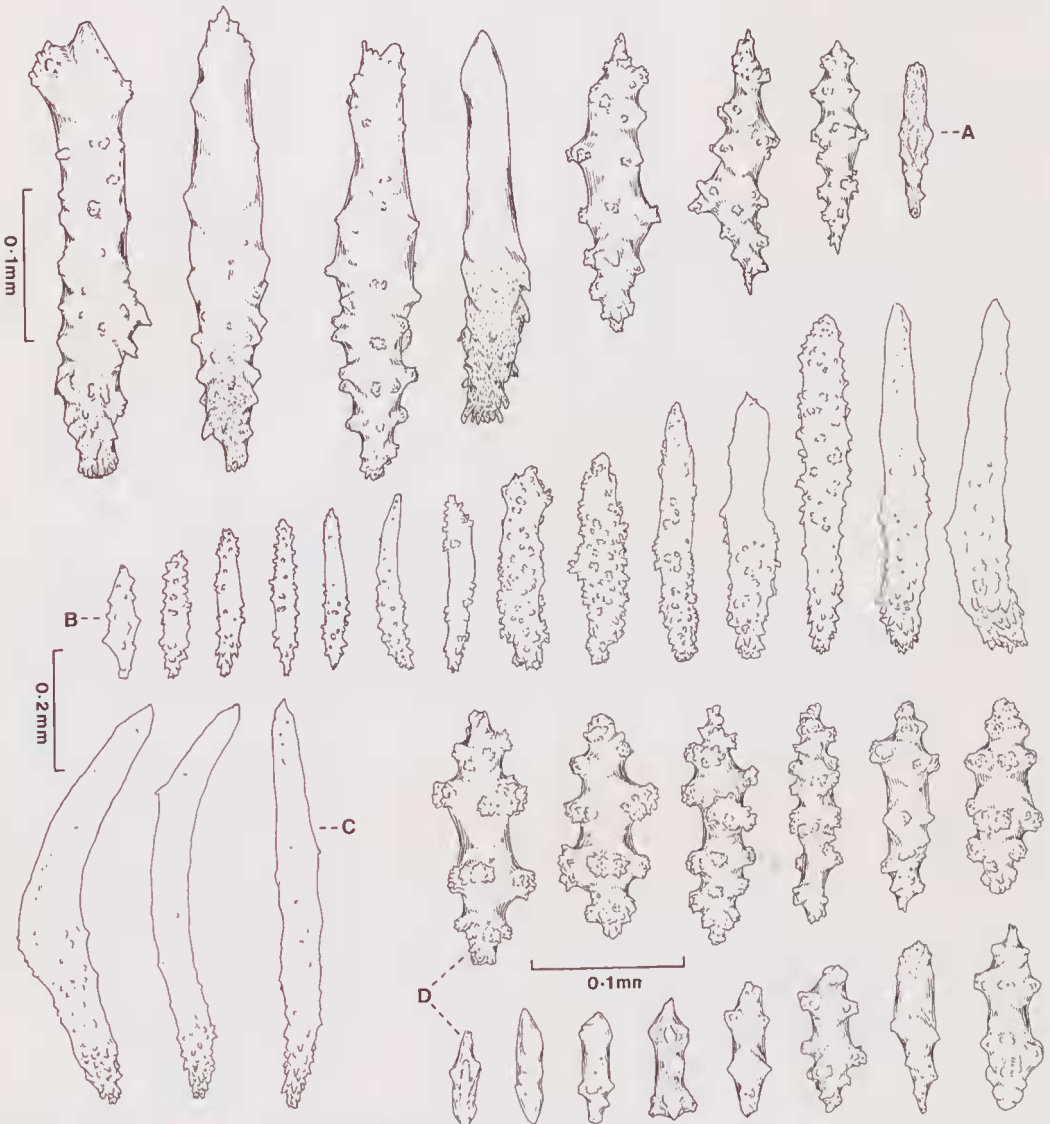


Fig. 2. *Hicksonella expansa* holotype: A-B, coenenchymal rods and probable developmental stages; C, coenenchymal rods; D, sclerites from the coenenchyme next to the axis.

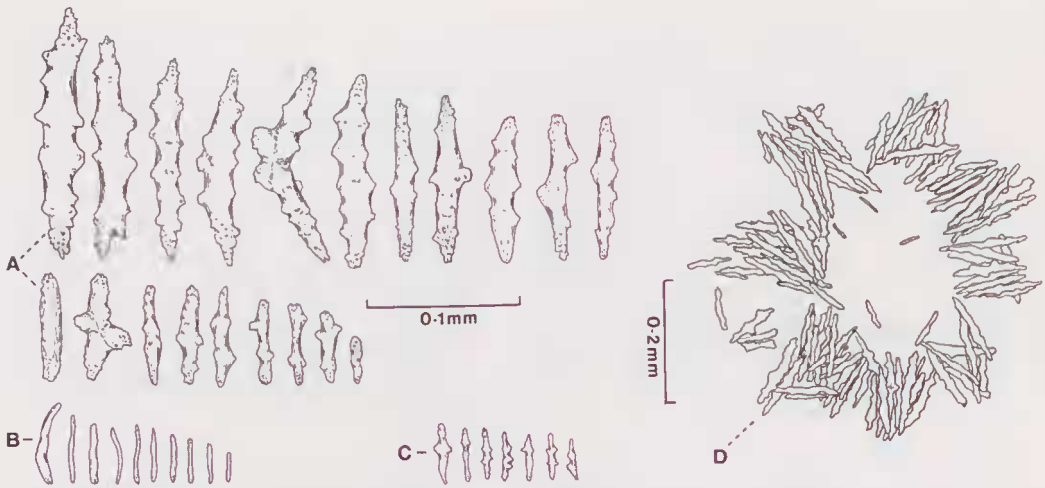


Fig. 3. *Hicksonella expansa* holotype: A, anthocodial sclerites; B-C, sclerites from the tentacles; D, arrangement of anthocodial sclerites.

polyps appear as minute apertures in the coenenchyme 0.18 mm to 0.42 mm in diameter. However, a number of polyp apertures are raised on small calicular domes which may be 1 mm high. These domes are usually restricted to areas of the coenenchyme covering the larger branches and branchlets and seem correlated with the depth of the coenenchyme in these zones. The polyps on one face of the colony are spaced approximately 0.8 mm to 2.1 mm apart. On the opposing face the density is somewhat less with polyps being up to 6 mm apart on the larger branches. Apart from polyp domes, where no specialised calicular sclerites occur, and the rounded ridges above the axial ramifications, the coenenchyme is quite flat and smooth. The colour of the colony in spirit is pale yellowish white.

The sclerites of the surface layer (Fig. 1A) are predominantly wart clubs, up to 0.08 mm in length, occasionally larger, with a central apical wart. Characteristically there is a whorl of 3 large warts, somewhat bifurcated, in the club head. One such club has been drawn viewed end-on from the handle (Fig. 1Aa). A few crosses and some clubs with poorly differentiated heads also occur.

Below the layer of clubs the sclerites are warty spindles up to 0.55 mm in length (Fig. 1C,D). There is little regularity in size or density of warring or in overall sclerite shape as can be seen in the small scale drawings Fig. 1D. Occasionally club-like forms (Fig. 1B)

and crosses are also found. Some of the spindles have a waist, as in Fig. 1Da.

The layer of coenenchyme immediately next to the axis contains small rods and spindles 0.05 mm to 0.15 mm long, often with warts in girdles (Fig. 2D).

Peculiar to the genus is the presence of large, straight or curved, rod-shaped to spindle-shaped sclerites with a characteristic short warty or thorny handle and a long, predominantly smooth, shaft (Fig. 2C). The distribution of these forms in the holotype follows no detectable pattern. They are not common and many sclerite samples will fail to detect them. If the colony surface is viewed under a low power microscope, areas will be found where the surface sclerite layer is thin and clubs are scarce. The spindles of the lower layer predominate here showing up as glassy bodies in the sugary looking surface. Sampling of these areas occasionally revealed this unusual sclerite type as did the calyces. Associated with the more classical form of the sclerite, which reaches 0.6 mm in length, there are also found numerous variations and smaller probable developmental stages (Fig. 2A, B) which are recognisably different from the warty spindles typical of this layer.

The spiculation of the polyps is typical of the family with the tentacle bases being armoured with numerous flattened rodlets 0.026 to 0.150 mm in length (Fig. 3A). Nearly all of the polyps are tightly contracted

measuring only 0.3 mm in diameter. The arrangement of the sclerites is far from obvious in these forms and a rare more expanded polyp, 0.5 mm across, was used for Fig. 3D. The tentacles contain minute rodlets 0.017 mm to 0.035 mm in length (occasionally larger) which maybe smooth (Fig. 3B) or

possess protuberances (Fig. 3C). Polyps may have either form or a combination of the two.

Etymology. The specific epithet refers to the expanded nature of the coenochyme.

Variability. In addition to the uncommon occurrence of the large smooth shafted rods,

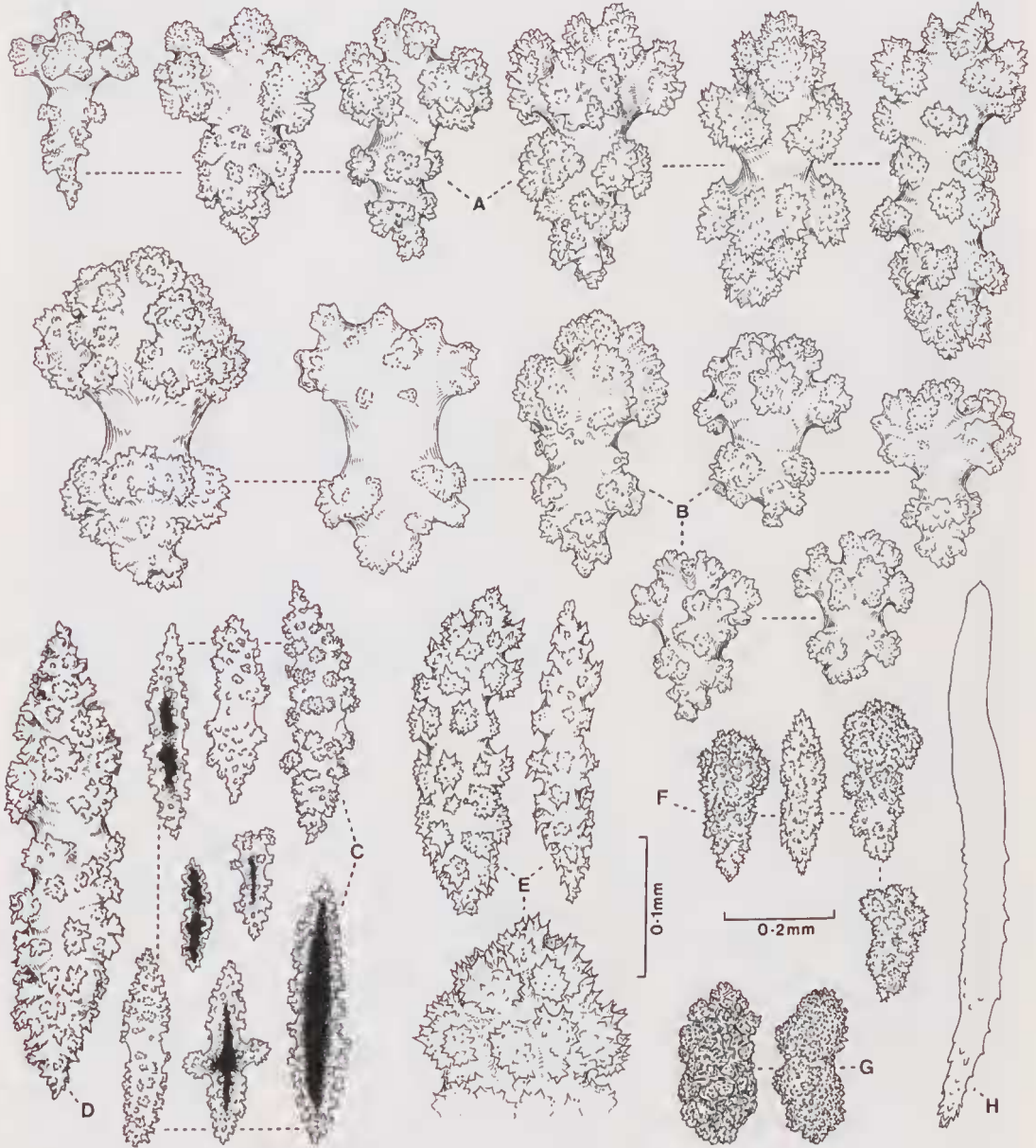


Fig. 4. *Hicksonella expansa* paratypes: **A**, clubs and spindles from NTM C4168; **B**, clubs from the calyces of USNM 76294; **C-D**, subsurface sclerites from NTM C4171; **E-F**, thorny warted spindles from QM GL2742; **G**, densely warted spindles from NTM C4173; **H**, coenenchymal rod from NTM C4174. **A, B, D, E**, 0.1 mm scale; **C, F, G, H**, 0.2 mm scale.

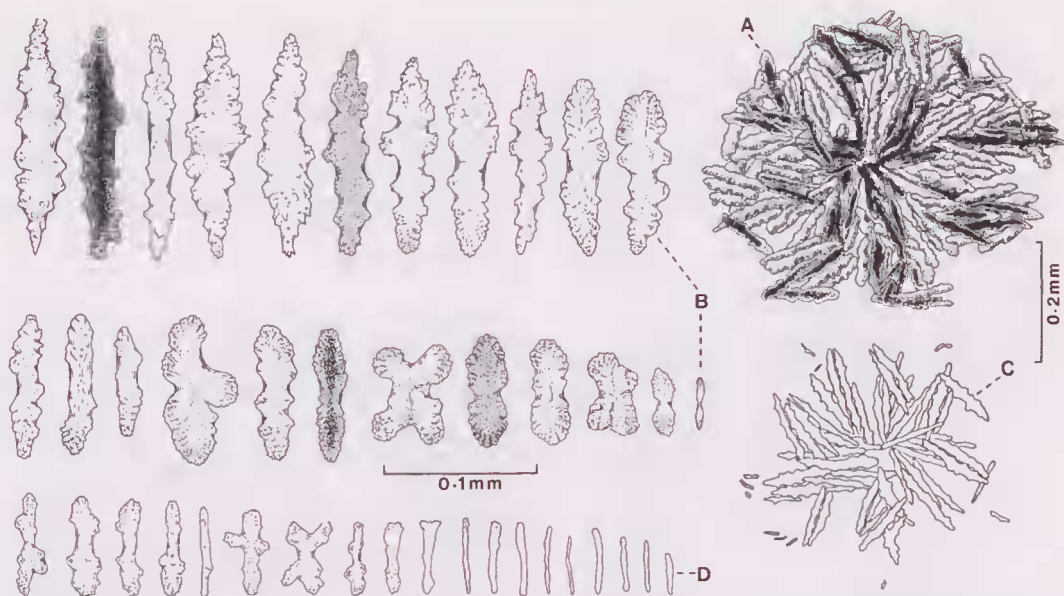


Fig. 5. *Hicksonella expansa* paratypes: A, anthocodial sclerite arrangement in NTM C4171 and NTM C4172; B, anthocodial sclerites (lower row from tentacles) in NTM C4171 and NTM C4172; C, anthocodial sclerite arrangement in QM GL2742; D, tentacle sclerites from USNM 76294.

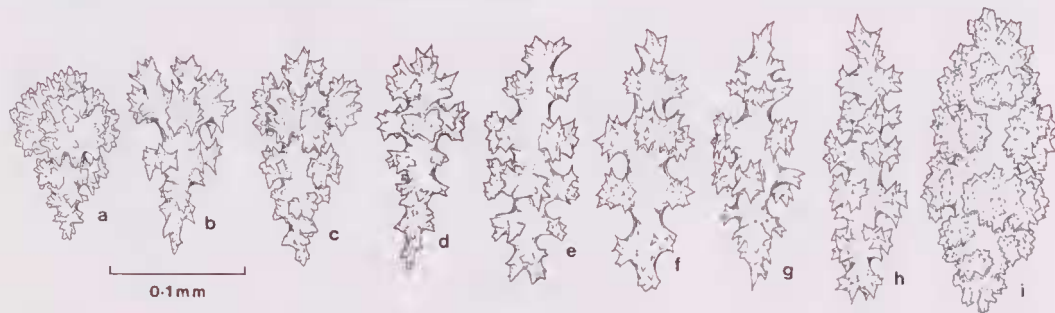


Fig. 6. *Hicksonella princeps*, NTM C3312, coenenchymal sclerites.

sclerite samples from the holotype may show a preponderance of clubs, a larger percentage of waisted spindles or, rarely, sclerites with large, high, tuberculate warts (Fig. 4A).

Seven colonies studied with the holotype are designated as paratypes. Variation within the whole suite of specimens is considerable.

With respect to colony form 3 of the paratypes have marked reduction in the extent of webbing with a number of branches showing no coenenchymal extensions at all. These are USNM 76294 (Fig. 8B), NTM C4173 (Fig. 7B), and NTM C4174 (Fig. 9A).

The extent of webbing is greatest in QM GL2742 (Fig. 9B), which has grown as several close lamellae with the spaces between the axial ramifications of each lamella almost

completely filled in with expanded coenenchyme. This specimen, more than any other, has obvious differences between the two faces of the colony. Most noticeably, over the thick main branches the coenenchyme is thicker on one face leaving higher branch ridges on that side. Numerous polyp calyces, and a number of small twigs growing erect from the surface, give this face of the colony a rugose appearance.

With regard to the depth of the coenenchyme, in specimen USNM 76294 it appears greater than in any other colony. This is especially noticeable in the clavate ends of the branches where the axis is hair-like but the total branch diameter is up to 5 mm. Contrastingly NTM C4173 (Fig. 7B) has

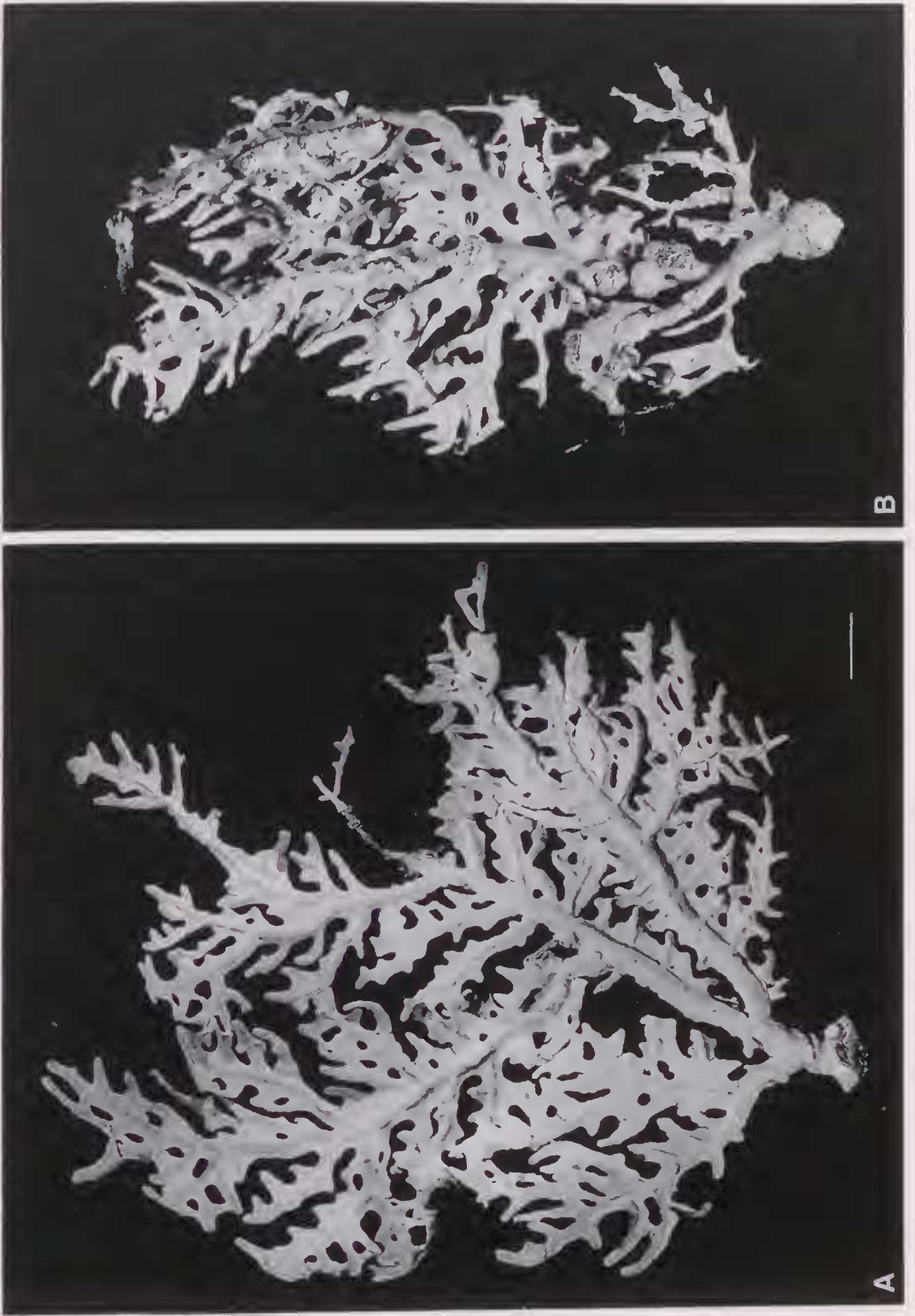


Fig. 7. *Hicksonella expansa*: A, holotype; B, paratype NTM C4173. Scale 20 mm, both to same scale.

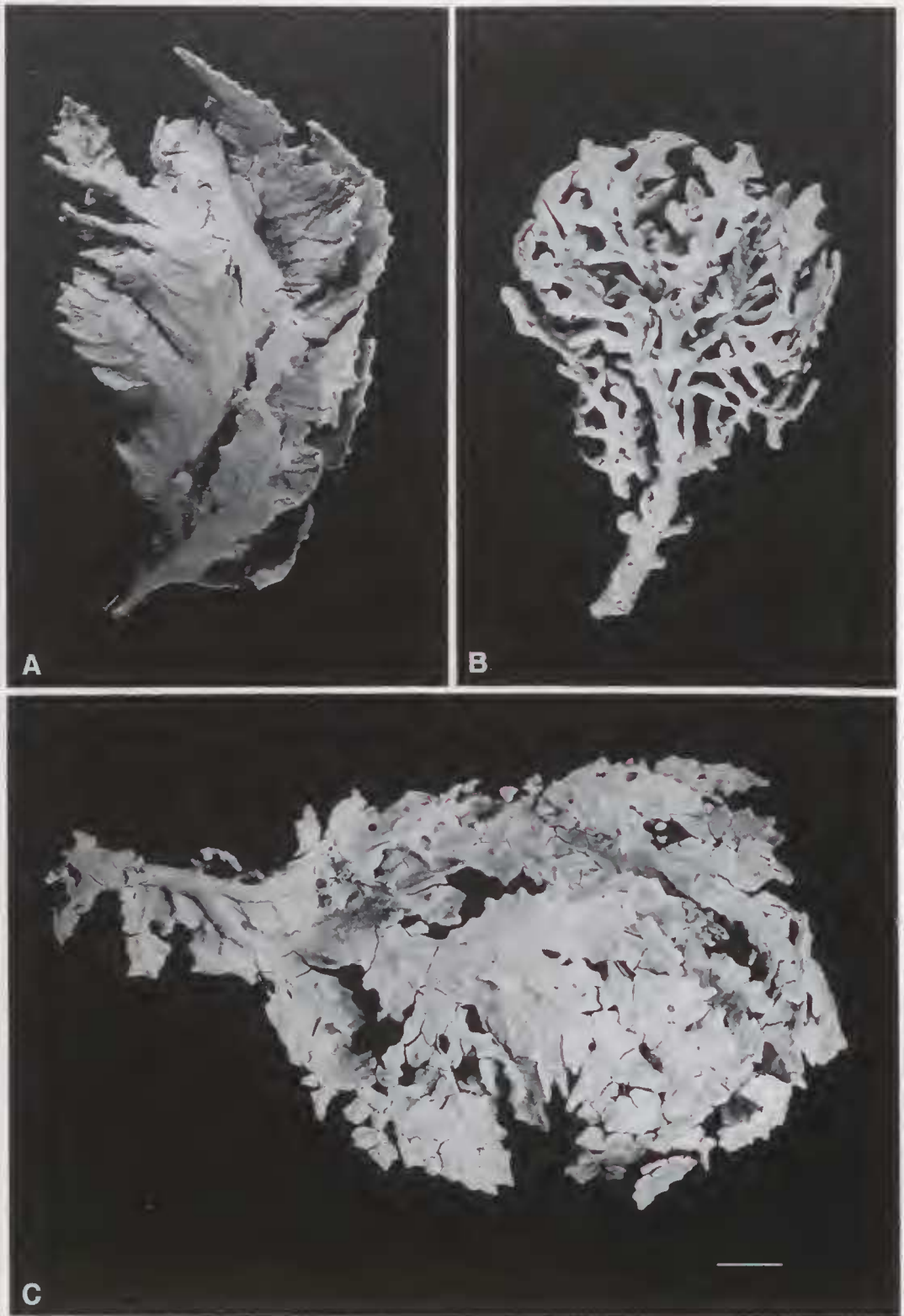


Fig. 8. *Hicksonella expansa* paratype: A, NTM C4168; B, USNM 76294; C, NTM C4171. Scale 20 mm, all to same scale.

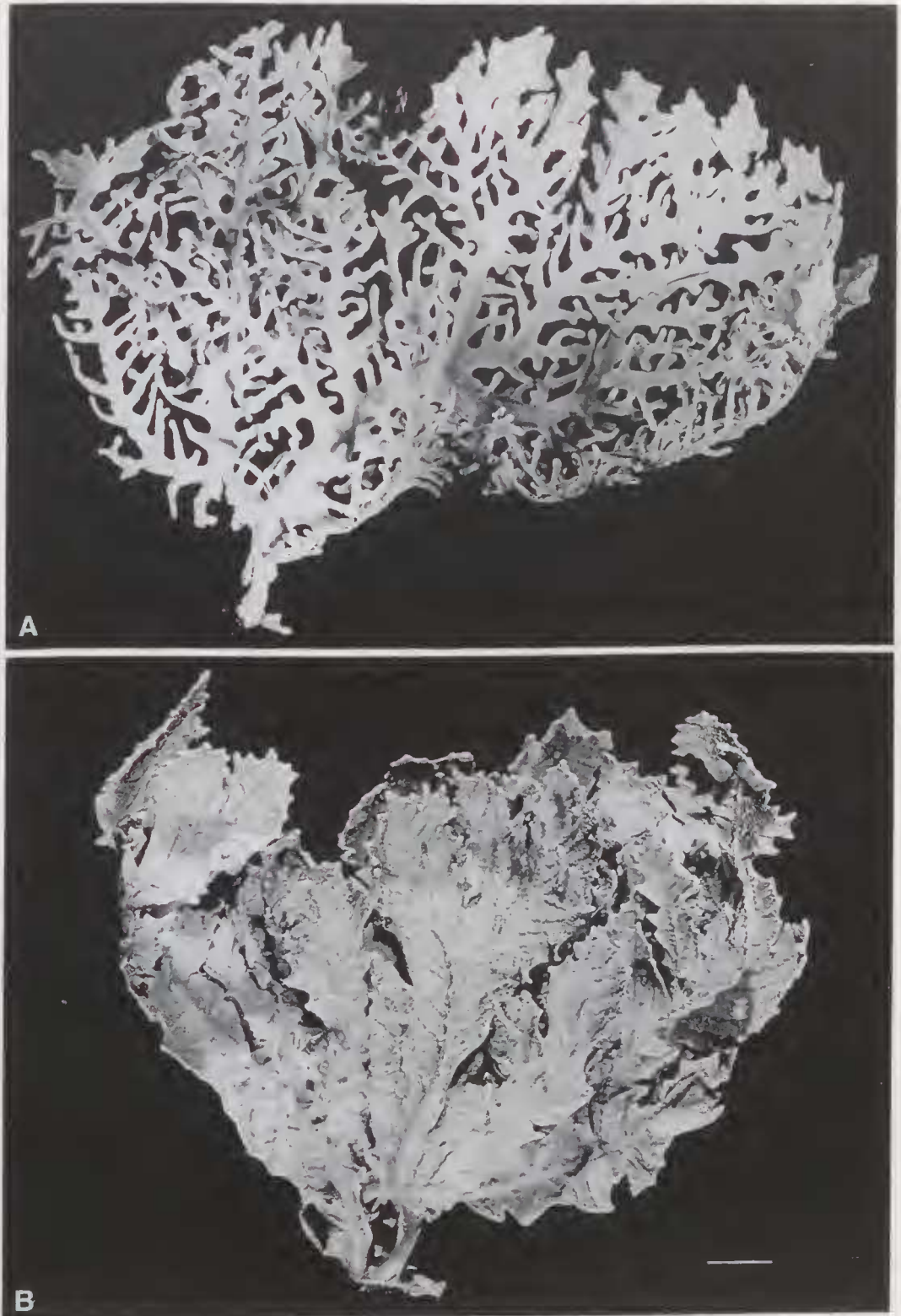


Fig. 9. *Hicksonella expansa* paratype: A, NTM C4174; B, QM GL2742. Scale 20 mm, both to same scale.

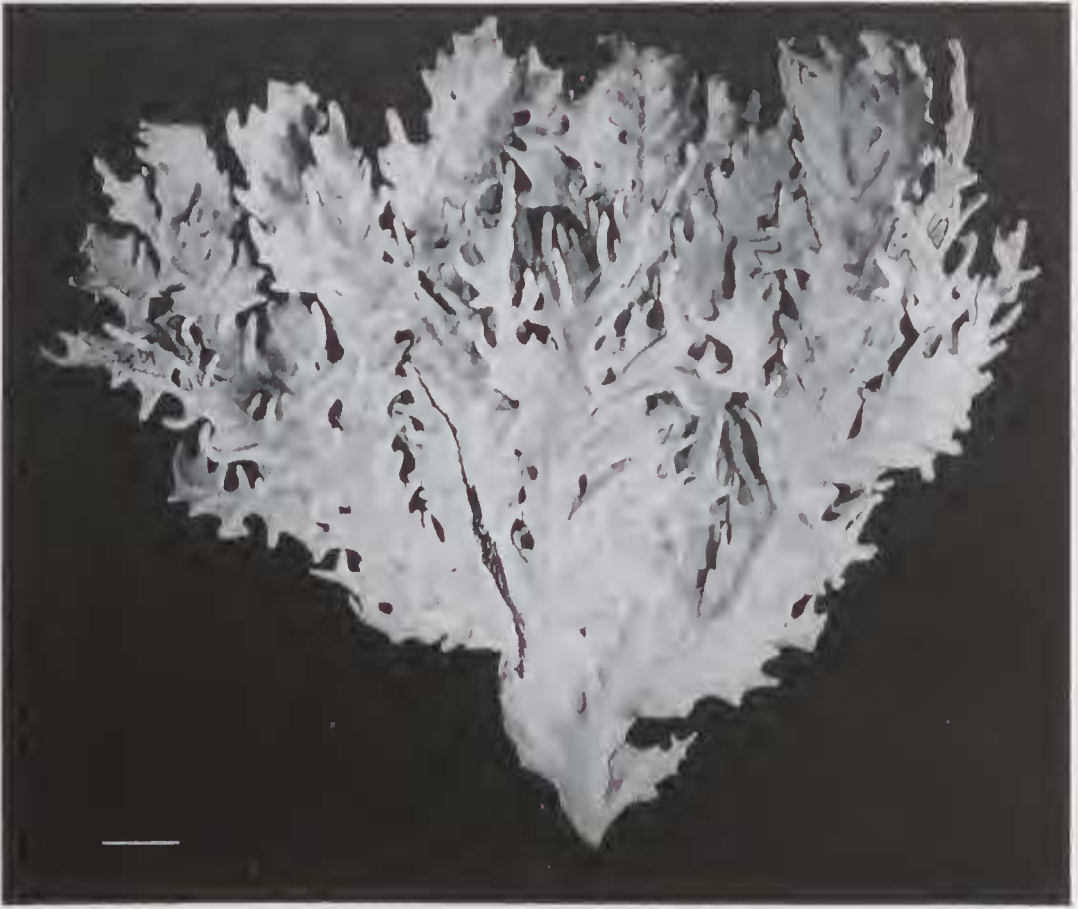


Fig. 10. *Hicksonella expansa* paratype, NTM C4172. Scale 20 mm.

extremely thin coenenchyme with the dark axis showing through the very pale and translucent tissue.

Specimen NTM C4168, a piece of which is shown in Fig. 8A, is 2 portions of a larger colony which may have resembled QM GL2742.

Colony NTM C4172 (Fig. 10) also shows considerable expansion of the coenenchyme. The several lamellae which make up the colony are in places anastomosed. This specimen has numerous terminal twigs, many of which arise from the lamellae at an acute angle.

Specimen NTM C4171 (Fig. 8C) is a single lamella with only a few angled twigs. There is little difference between the faces of this colony.

Apart from QM GL2742, colony colour in all paratypes is similar to that of the holotype. The light brown colouration of

Queensland Museum specimen may be a result of its initial preservation with other organisms.

As in the holotype, NTM C4172 and USNM 76294 also have numerous large sclerites visible in the surface layer of clubs. This trend is taken to an extreme in NTM C4173 where the surface layer of clubs is so reduced that sclerite samples are predominantly spindles. In the remaining colonies the surface layer of clubs is more or less entire.

With respect to the long smooth-shafted rods, NTM C4173 is like the holotype and samples of sclerites may not include this form. When present they are usually very small (less than 0.3 mm) although they can be up to 0.55 mm in length. In all other specimens this type of sclerite is fairly common and averages larger. It is especially frequent in the calyces and tips of branches. USNM



Fig. 11. *Hicksonella expansa* silhouettes: **A**, holotype NTM C4170; **B**, NTM C4172; **C**, OM GL 2742; **D**, NTM C4174. Not to scale.

76294 is quite remarkable in this regard with unusual large concentrations occurring in branch tips. Here, and in other areas of the colony, occasional smooth shafts visibly protrude from the coenenchyme. The largest rod encountered, 1.0 mm in length, came from NTM C4174 (Fig. 4,H).

Other sclerite variations also occur throughout the series. Although examples of most of the forms shown in Fig. 4 may occur in the majority of colonies, individual specimens appear to have higher concentrations of a particular type. The clubs and spindles with large complex warts (Fig. 4A) are from NTM C4168. The calyces of USNM 76294 contain clubs (Fig. 4B) where the handles are poorly differentiated. Spindles with thorny warts (Fig. 4E) sometimes very dense (Fig. 4F) are common in QM GL2742. Specimen NTM C4171 has large numbers of spindles

with a central waist and the occasional cross (Fig. 4C,D). The 2 plump sclerites with extremely dense sculpture (Fig. 4G) are from NTM C4173.

A feature of the spiculation of all specimens is the presence of coenenchymal sclerites that exhibit a darkly coloured interior when viewed with transmitted light (Fig. 4C). The density of colouration is usually quite variable as is the percentage of sclerites in which it is observed. The phenomenon is extremely marked in NTM C4171 and NTM C4172 where it is also seen in the polyp sclerites. When viewed with incident illumination sclerites of this form appear to have a dense white core.

Polyp armature is also variable and two further examples are illustrated. In Fig. 5 colonies NTM C4171 and NTM C4172 are represented by diagram A. Both of these col-

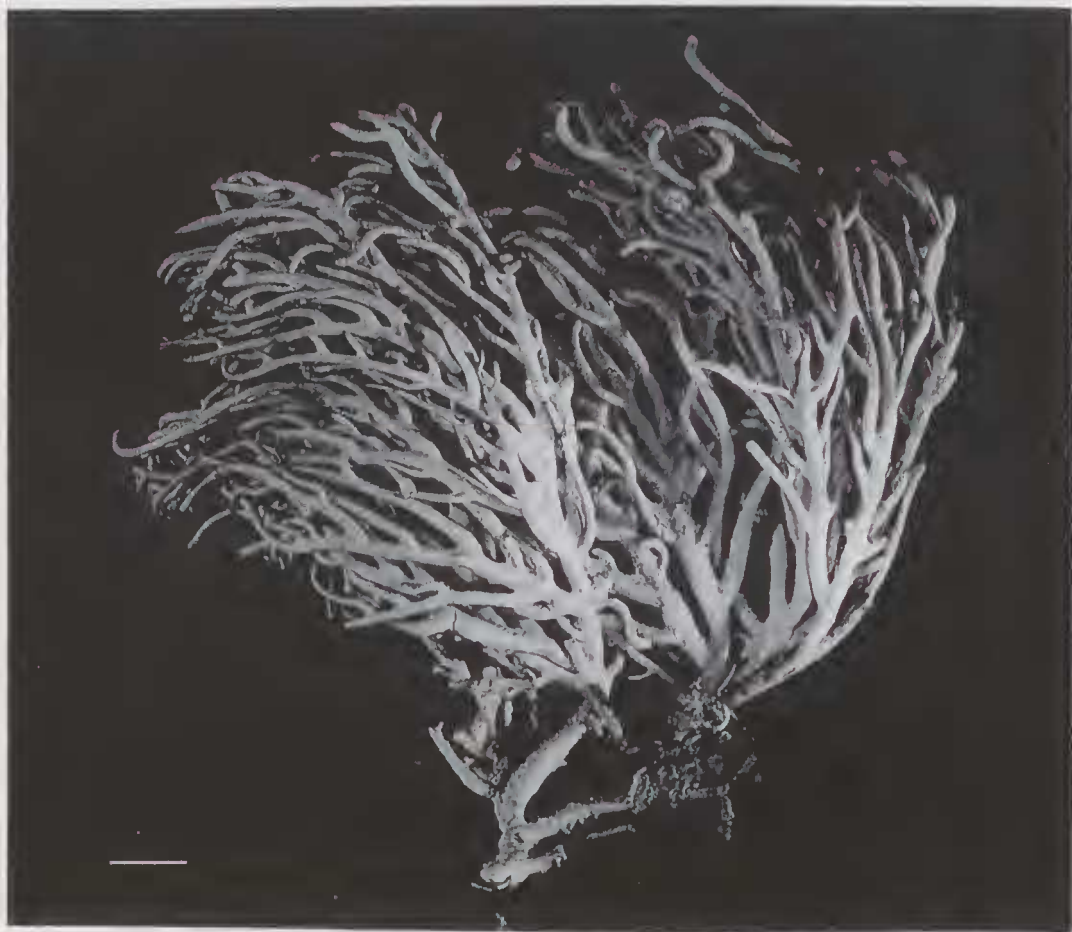


Fig. 12. *Hicksonella princeps*, NTM C3312. Scale 20 mm.

onies have somewhat robust polyp sclerites (Fig. 5B, top row) and a few unusually large and scale-like ones in the tentacles (Fig. 5B, lower row). In contrast the polyp armature of colony QM GL2742 is very slight (Fig. 5C). The tentacles of USNM 76294 have unusually large numbers of minute sclerites, a range of which is shown in Fig. 5D.

Systematic position. *H. princeps* Nutting, 1910, is the only other known member of the genus. On the present evidence little difficulty should be encountered in distinguishing between the two. As can be seen from Fig. 12, *H. princeps* has a dense bushy growth form with cylindrical branches. In this colony (NTM C3312) virtually all the polyps have calyces, (this is not so in other specimens), and they are evenly distributed around the branches. A number of anastomoses and small coenenchymal expansions are present. There are a number of areas where several branches are united at their bases by a web of coenenchyme. Some of these areas can be seen near the centre of the photograph of the colony. All colonies in the N.T.M. collection are light brown. Although heavily warted clubs and spindles (Fig. 6a,i) are found in *H. princeps*, particularly in older parts of the colony, very large numbers of the kind of clubs and girdled spindles shown in Fig. 6b-h also occur. These latter forms, with high thorny warts, should, along with colony shape, serve to differentiate between the two species.

It is to be noted that the same colony form and the same thorny clubs and spindles found in *H. princeps* are also found in specimens *Rumphella*. Apart from the occurrence of calyces and large smooth shafted sclerites in the former, both of which are variable characters, there seems little to distinguish the two taxa, but a close examination of *Rumphella* needs to be made.

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